

**A Project Report**  
**on**  
**SMART DUSTBIN**

**Abstract** - Every person in this world throws waste in the form of plastics, wet waste, dry waste and etc. Also, every person looks for a place or a plastic container to dispose that waste, that plastic container is the Dustbin which they look for. Dustbin is a plastic container where everyone can dispose their waste. Dustbin is used as a storage place to dispose waste, but we cannot estimate the exact amount of waste disposed by a society, and the dustbin cannot take more waste as the space should be available in it to take more. We need to know the level of waste in the dustbin and based on that we can intimate people to use the dustbin or not. In this Smart Dustbin project, we have designed a prototype where the lid of the dustbin is opened, on detection of hand clap or foot tap signal and if the dustbin has empty space the lid of dustbin will open or if the dustbin is full the owner will be notified. The main components we used in making this prototype are Arduino, Servo Motor and Ultrasonic Sensors, Sound Sensor and Wi-fi Module. The software component is the application named as Thingspeak which is used to get notification. This dustbin can be a start to Smart Waste Management System where the officials can clean or empty the dustbin which depends on the notification received by them and not waiting for a call from a person of a society who informs the garbage trucks to come and take the waste from them.

### Introduction

Dustbin is the storage container used for disposing waste by each and every person in the world. The main thing they look in their surroundings for disposing waste is the Dustbin. Smart Dustbin is just a normal bin where everyone can dispose waste but integration of some hardware components is done for more efficient use of it. Smart Dustbin is integrated with some hardware components such as Arduino, Sound Sensor, Servo Motor, Ultrasonic sensors. These components help in opening the lid, on detection of sound signal and also sending the notification. The code required to perform the above-mentioned operation is dumped in Arduino.

### Objective

Dustbin should detect the sound signal to open the lid so the user can throw the garbage into dustbin, we will use a Sound Sensor. After the signal detection, dustbin should check the empty space in the bin so level sensing ultrasonic sensor that measures the level of garbage in the bin is used and detects if it is about to fill up. When the bin is full owner must be notified, for that we will use wi-fi and Thingspeak Platform.

### In Literature so far

First is the traditional method or the normal use of Dustbin in our daily life. Each and every person in the world disposes the waste in the dustbin and if the dustbin becomes full, he empties the waste inside the bin and again uses the same Dustbin. This is the basic use of a normal dustbin

where no components are used, no coding is done and where everything is manual i.e. everything is done by hand. The maintenance of the bin is also not proper where the lid is broken which leads in the overflowing of the waste from the bin. The advantages of using this method of disposal is the waste will be disposed in the bin and emptying the bin is easy as there are no electronic components used.

### The System for Smart Dustbin

The proposed method for this smart dustbin is use of Wi-Fi module which is more beneficial than using GSM module. The hardware components used in this method are given below-

Hardware Requirements -

- Arduino Uno
- Ultrasonic Sensor
- Sound Sensor
- Wi-fi Module (ESP8266-01)
- Resistors
- Cables and Connectors
- Breadboards
- LED
- USB-cable
- Push Buttons
- Switch

### Arduino Uno R3:

The Arduino Uno is a microcontroller board. It has 20 digital and analog input/output pins, a 16 MHz resonator, a USB connection, a power jack, an in-circuit system programming header, and a reset button. This auxiliary microcontroller has its own USB bootloader, which allows advanced users to reprogram it. The Operating Voltage of the Arduino is 5V Flash Memory -32 KB, and 0.5 KB memory is used by the boot loader. Digital input and output pins-14. Analog i/p pins are 6.



Figure 1-Arduino UNO

**Ultrasonic Distance Sensor:** Ultrasonic Distance Sensor is a sensor that can measure distance. It emits an ultrasound at 40 kHz which travels through the air and if there is an object or obstacle on its path it will bounce back to the module. Considering the travel time and the speed of the sound we can calculate the distance. It contains three pins : GND (Ground), Power Supply, Signal (Contains both Trigger and Echo function)



Figure 2-Ultra Sonic Sensor

**Wi-fi Module:** ESP8266 is Wi-Fi enabled chip. Also known as wi-fi module. It is used for implementing IOT. To communicate with the ESP8266 module, microcontroller needs to use set AT commands.



Figure 3- Wi-fi Module ESP8266

**Sound Sensor:** A sound sensor is defined as a module that detects sound waves through its intensity and converting it to electrical signals.



Figure 4-Sound Sensor

**Servo Motor:** A Servo Motor is a small device that has an output shaft. This shaft can be positioned to specific angular positions by sending the servo a coded signal.

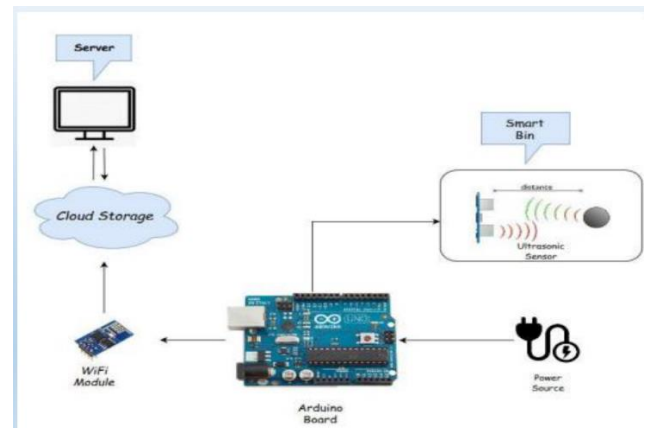


Figure 5- Servo Motor

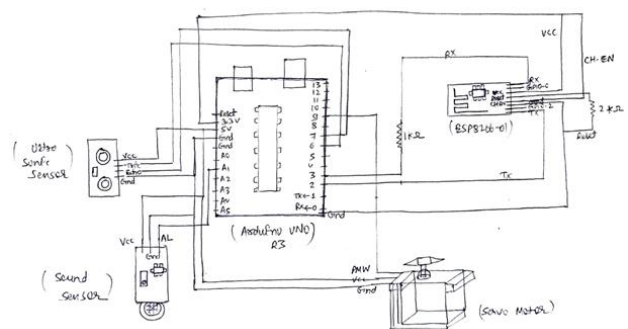
## Workflow:

- A Sound sensor will receive the clap signal.
- An Ultrasonic sensor is attached to the top of the bin.
- The ultrasonic waves from the sensor are reflected back from the garbage in the bin. Using this, we calculate the percentage of empty space in the bin.
- When the bin is full the data is sent to Thingspeak using ESP8266-01 (Wi-Fi module).
- If bin has empty space the servo motor will rotate 90 degree so that lid could be open.

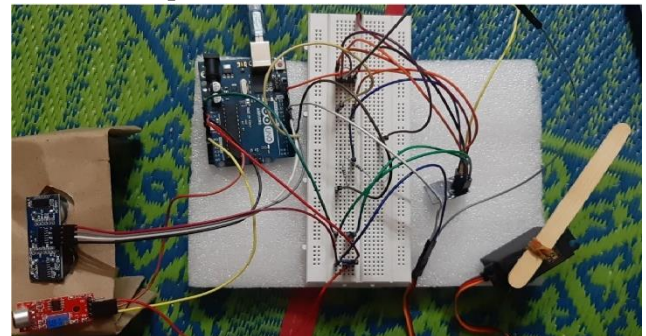
## Block Diagram:



## Circuit Diagram:



## Hardware Implementations:



## Results

- Our smart dustbin is able to operate contactless( using clap sound) and can be remotely track for the garbage in the dustbin.
- System is detecting the signal and opening the lid properly.
- When there is no empty space in the bin, owner is notified.

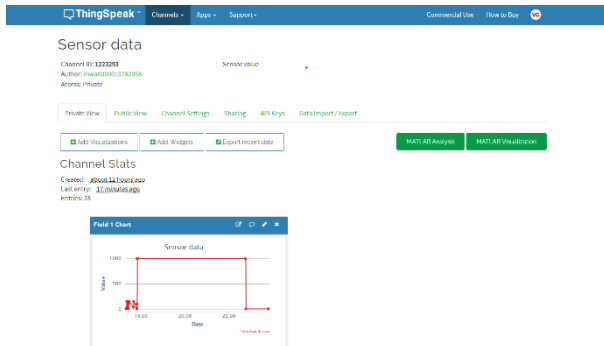


Figure 6-Thingspeks record(when dustbin is full)

## Conclusion

IOT based Dustbins help the people to manage the waste easily and help them reduce the work of calling or waiting for the specific person to make the area clean and makes a heathier environment to live. They won't be any kind of diseases and the people will be fit and are not prone to diseases caused by these waste materials. The mission Swachh Bharat can also be implemented easily. This system assures the cleaning of dustbins soon when the garbage level reaches its maximum. It will take power supply with the help of battery. It ultimately helps in keeping the surrounding clean and the waste management can be much easier.

## Future Scope

The above method is just a stepping stone for implantation of IOT. There can be many enhancements done for this prototype which can be a revolutionary change in maintaining our environment clean and healthy. The few enhancements can be done are: The implementation of

more collective bins placed side by side where it automatically detects the type and waste and places in the correct bin color which is assigned for that type. This bin is of a vast usage in offices, homes and even in public places for garbage management. Thus, we get a fully automated smart dustbin that allows for automated garbage cleaning. These dustbins can be placed with a GPS tracker where the dustbins in a particular locality can be located easily and the waste can be emptied. This method can lead to Smart Waste Monitoring System.

## References

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